

LXI690G

Industrial-grade External GPRS Wireless Data Transmission Unit (DTU)

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1 STRUCTURE AND PERFORMANCE OF THE PRODUCT

1.1 Summary

LXI690G is an industrial grade with GPS global satellite positioning function GPRS DTU product. The product integrates a high-performance, low-power industrial-grade GPS module and GPRS module. It combines perfectly GPS global positioning technology and GPRS wireless communication technology.

LXI690G platform based on ARM and embedded operating system, built-in industrial-grade module, it can be used in harsh environments, working temperature range can be up to $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$. LXI690G provides standard RS232 serial interface, can be quickly and PLC, industrial control, instruments, meters, RTU equipment is linked together, through the GPRS network will be linked to LXI690G equipment data transmission to a host on the Internet, realize the data remote transparent transmission, at the same time to the front-end equipment of GPS location information reported to host, realize positioning of the equipment.

LXI690G has positioning, wireless data communications and data processing capabilities in a compact. Rugged, reliable, easy to install. It can be widely used in construction, transportation and other industries. Particularly suitable for tower crane monitoring, heavy machinery management. But also can be used in the field of taxi operations management, transport vehicles, special vehicles, vehicle rental management and leasing.



Figure 1.1 LXI690G product appearance

1.2 Product Features

- ❖ Each frame can be set to 1024B length (CACHE 4 frames), suitable for continuous transmission of large amounts of data;
- ❖ Use of Aweigh industrial GPRS module, embedded protocol stack;
- ❖ Supply voltage range: 6V to 36V;
- ❖ Apparatus having power off function, convenient user control;
- ❖ Data transparent transmission, the user does not need to understand the complex TCP/IP, PPP and other protocols;
- ❖ Support data center dynamic domain name or IP address access;
- ❖ Support for alternate data center;
- ❖ Support APN virtual private network service;
- ❖ Support online forever、Idle offline, idle power down, ringing offline, SMS offline, data center command offline and other online mode;
- ❖ Support for user data, SMS and telephone wake-up function;
- ❖ Support break automatically reconnect function;
- ❖ There is advanced feature the flexible connecting network. It can save much GPRS network flow;
- ❖ Support local and remote graphical interface to configure and maintain;
- ❖ Support SMS configuration and maintenance;
- ❖ Support the virtual serial port data center functions, the seamless connection of the existing PC software;
- ❖ Supports GPS positioning data reporting and query functions, data import google map to achieve precise positioning satellite map;
- ❖ Reliable design of multiple hardware and software, combined the watchdog technology, make the safe running of the equipment.

1.3 Performance Parameters

Table 1.1 The main parameters of LXI690G

Name	Parameter	remarks
Network type	GPRS mobile station type	CLASS B
	GPRS Multisport Class type	CLASS 10
Frequency	GSM850/900/1800/1900MHz	
GPRS network transmission rate	Down load channel	Max: 85.6Kbps
	Up load channel	Max: 42.8Kbps
Encoding type	CS-1、CS-2、CS-3、CS-4	
SIM card voltage	3V、1.8V	
Antenna Interface	50Ω/SMA	
Serial interface Level type	RS-232 Standard Level	
Serial port interface type	DB9	
Serial port baud rate	300~115200bps	Supports standard baud rate
Power supply	DC: +6V~36V	
power dissipation	Working: Max380mA (TBD)	Details refer to "model description" section
	Standby: ≤80 mA (TBD)	
	leisure: ≤80 mA (TBD)	
	Power down: ≤60 mA (TBD)	
Working temperature	-25℃~+70℃	
Storage temperature	-40℃~+80℃	

Humidity range	0—95%	Non-condensing
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Table 1.2 Indicator Status Description

LED Lamp	Color	State	Description
Power / Data state	Red	Light	Working status
		Flash	Data is being transmitted / Standby
Working	Green	Light	Already connected to a wireless network
		Light off	Not connected to a wireless network
		Fast flash	Connecting to data center
		Slow flash	Dialing
GPS	Green	Light off	No data is transmitted
		Light	Has positioned the latitude and longitude
		Fast flash	To find the satellite signal, but not locate of the latitude and longitude
		Slow flash	The satellite signal was not found

1.4 Mechanical Dimensions



Figure 1.2 LXI690G shell size graphics

1.5 Networking mode



Figure 1.3 Schematic plan

1.6 Typical connections

The LXI690G module allows the remote user equipment and management center computer for transparent data communication .Transparent data communication: There is no communication protocol between the user device and DTU. If DTU transfer data to the target PC,the software running on the PC can receive what DTU sent.For example, the user device sends a byte of data "0x68", then run on the PC side software will receive a byte of data "0x68".Same if PC transfer data to DTU.



Figure 1.4 Remote monitoring program

2 EQUIPMENT INSTALLATION

The product must be installed correctly, in order to achieve the desired design requirements; this section mainly explains the installation step product .

2.1 Antenna Installation

The antenna interface is a 50Ω SMA pedestal. And the external antenna must be compatible with GPRS module. If not, there is a risk to damage product, and DTU also can't work.

2.2 SIM Card Installed

The product is used in a mobile GPRS network, so we need to purchase the operator SIM card. Before installing the SIM card, the first to use a sharp object (such as a small screwdriver) ,press the drawer yellow dots, to make DTU shell on the SIM card drawer pop up. The specific steps are as shown in figure 2.1.

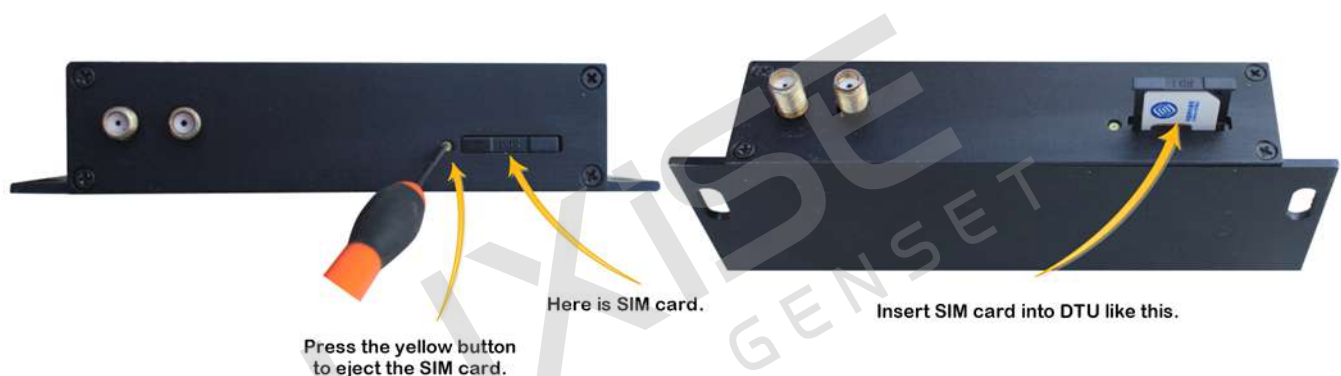


Figure 2.1 Remove the SIM card drawer

After take out the drawer, fix SIM card into it. Then put them back to product. Detail in **Figure 2.1**

✧ Note: It inhibits to take out SIM card during DTU running with power. During initialization, the SIM card will be deleted all SMS text messages. We apologies that your useful information is lost if you don't backup them.

2.3 Power Selection And Installation

Voltage supply range of the product is +6 V ~ 36V, power supply ripple control in less than 300mV. When the product for wireless communications, instant change of current will be great, so the external power of resistance should be as small. When using a 6V power supply cables to try to rough.

2.4 Terminal Signal Description

✧ Note: The interface signal level is accord with the RS-232 protocol standard ($\pm 12V$) .It can't directly drive the TTL device. If not, the TTL device is possible to be damaged. Next is the typical connecting solution.

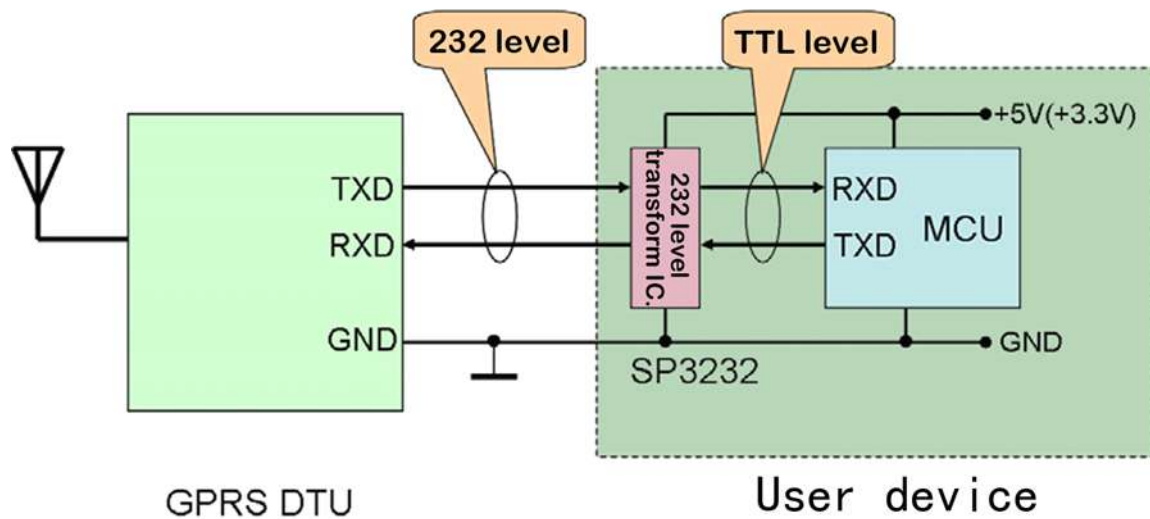


Figure 2.2 DTU and user equipment interface

2.5 System Connection

After the completion of the above installation, it is success of the remote communication system. As shown in Figure 2.4.

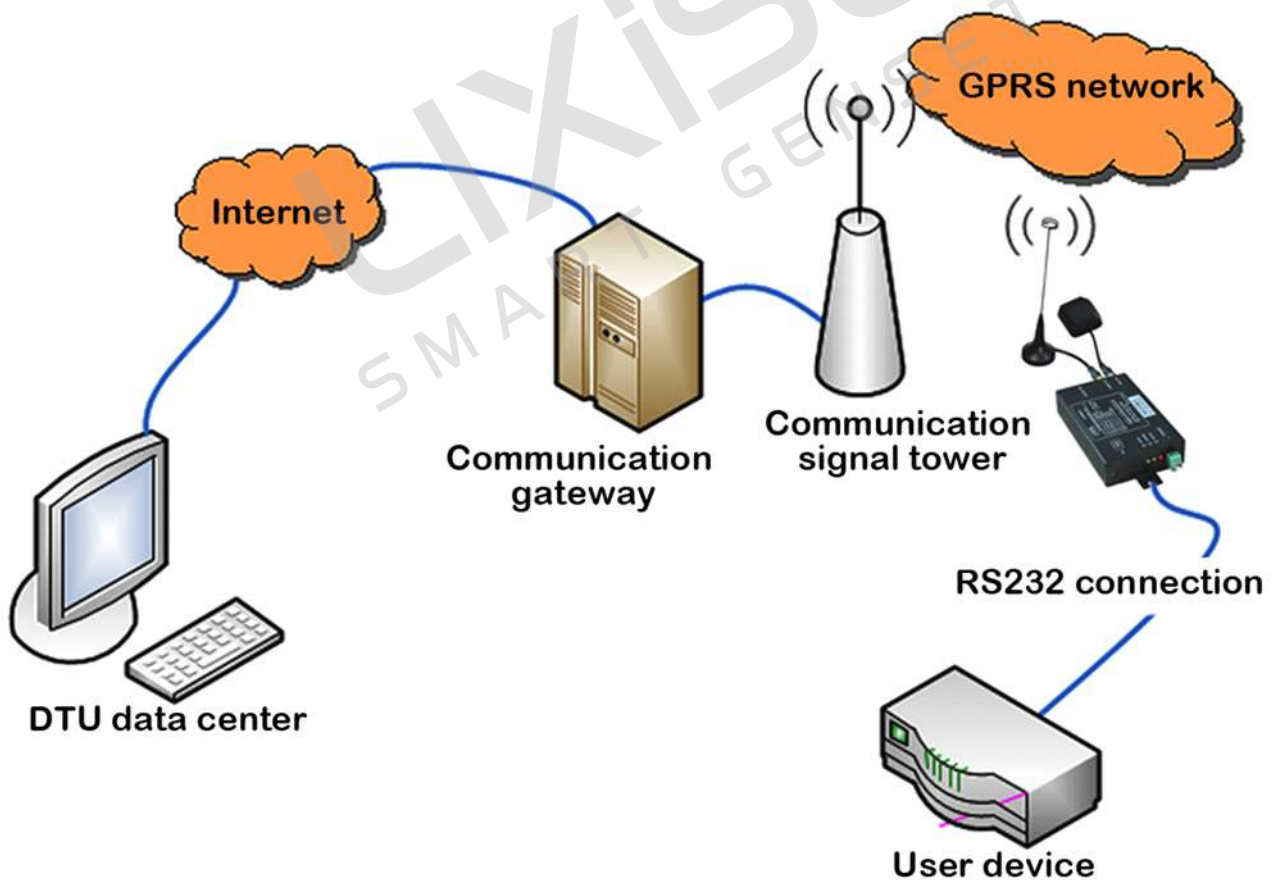


Figure 2.3 System Connection

3 Device Configuration

3.1 Configuration Method Of DTU

LXI690G is powerful. It has many function configuration. If it is distinguished by the configuration page, including "the character configuration" and "graphical configuration", the character configuration doesn't requires any special tools. Any serial debugging tools (such as "serial debugging assistant") can directly to config the params. Graphical configuration using a special configuration tool (supporting software and product), the software interface is easy to use. Graphic configuration is used to set the configuration commands from the DTU, but the configuration tool for the completion of all commands issued and resolution. So users can also generate their own configuration tool.

From the distance to points, including "local serial port configuration" and "remote GPRS wireless configuration", they use the same command format. The entire configuration process as shown in Figure 3.1, The following contents, each operation step will introduce according to flow sequence, in order that you can be properly configured and read these parameters. Please read the contents carefully.

3.1.1 Enter The Local Configuration Mode

Open the configuration software, the DTU is connected with the computer via a RS232 cable. As shown in Figure 3.3

- 1: Click [Enter configuration state]
- 2: DTU power
- 3: Configuration software to display "enter configuration mode of success", can be configured for DTU.
- 4: After configuration is complete, click [Exit configuration state], DTU can enter normal working condition.

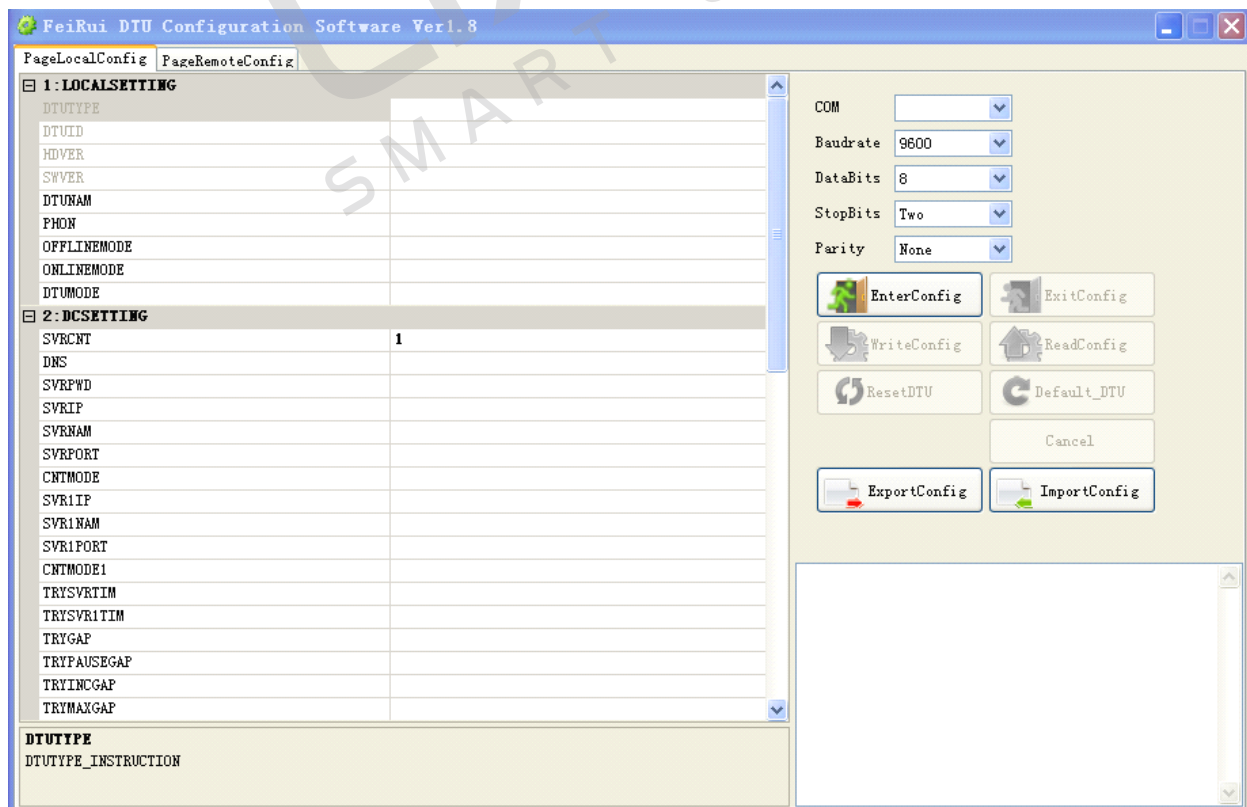


Figure 3.1 Configuration Software Interface

3.1.2 Remote Configuration Mode

The way for staff in the project is not convenient to on-site installation of equipment debugging, schematic as shown in figure 3.4. Remote ways to make DTU enter configuration mode, you need to meet the conditions, DTU is connected on the target server.

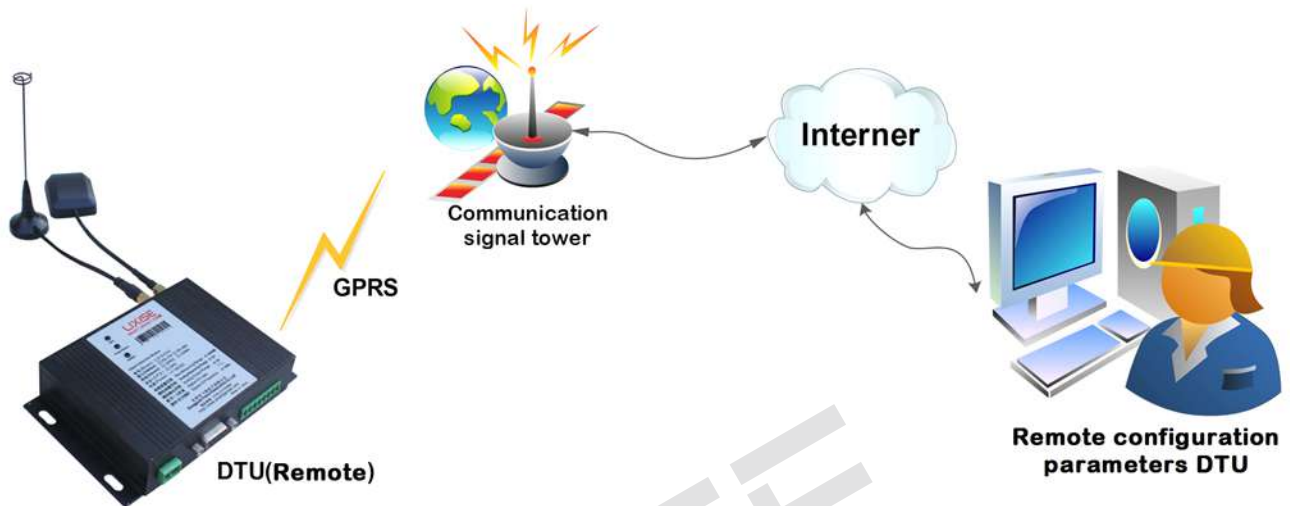


Figure 3.2 Schematic diagram of the remote configuration

3.1.3 Exit Configuration Mode

After the end of DTU configuration .if you want to enter the setup mode.you need through the serial port or remote server,send control commands in the "exit configuration mode"command to the DTU.

3.2Set Project Description (The device is equipped with AT command)

3.2.1 DTU TYPE

Modules for the product model number from 10 byte ASCII characters. This parameter is read-only type, set by the manufacturer, users can not modify.

3.2.2 DTU ID

This is the only identity number module, through this number, the server can identify the connected module.The number is 15 ASCII characters, set by the manufacturer, users can not modify.

3.2.3 HDVER, SWVER

They reflect the software and hardware version of the module information, the parameters set by the manufacturers, users can not modify.Users to seek technical support, to provide this information can get more specific suggestions.

3.2.4 DTUNAM

When using multiple DTU, name of the user can for these DTU configuration has practical significance.The device name is limited to 8 characters.

3.2.5 PHON

This parameter requires user configuration, but not DTU automatic generation. This parameter is not the system running conditions, it will not affect the running module, which is used for the server to read module of the mobile phone number.

This parameter is a ASCII character, such as "13712341234".

3.2.6 OFFLINE MODE

- ❖ Support online forever、Idle offline, idle power down, ringing offline, SMS offline , data center command offline and other online mode.
- ❖ Always online mode: Module power active connection set a good server, and maintained an online state, can rapid transmission of data at any time.
- ❖ Offline mode: When the module is connected to the server, if there is no data transmission over a period of time, DTU will be disconnected from the server into dormancy.And the period value can be set by "IDLETIM" config param. Its range is from 30 second to 65536 second.
- ❖ Idle offline: This mode is similar to the work of the"Idle offline", the difference is "idle power down mode" in DTU to disconnect from the server, DTU will cut off the power supply of the GPRS module, and make the whole system to enter a power down state, to achieve low power consumption.The system power down state, the machine consumes less than 60mA, suitable for battery-powered, intermittent communication occasions.

Note: In the DTU to disconnect from the server, there is only one way to re-establish the connection between the DTU module and the server.Is to send data to the serial port of DTU, DTU will be awakened, and then automatically connect to the data center server, the module connected server successfully sent the data.If the user device does not take the initiative to the DTU serial port to send data, DTU will not be able to connect to the server, please careful configuration of this.

- ❖ SMS offline mode: SMS activation module, send a message (as shown in Figure 3.3) to the module so that the module is disconnected from the server.Such as: 123456, LINEOFF, ON

DTU login password (6 character) ,LINEOFF,ON

Figure 3.3 Module Offline Message Format

- ❖ **Note:** The message format in the punctuation "," must be entered in the English format, "LINEOFF" can be lowercase.
- ❖ Ringing offline mode (Reservations) : When DTU is online, by phone call DTU in the SIM card number, so that the DTU offline.This model can reduce the communication cost of GPRS flow.(Please note that the configuration of the authorized user number)
- ❖ Data center command offline mode: Data center issued a disconnect from the server link to DTU.The user through the data center to realize the DTU disconnect server link. Without relying on other offline mode.

3.2.7 Online Mode

- ❖ Three kinds of online : user data wakeup, SMS wakeup, ringing wakeup.
- ❖ User data wakeup: DTU received from serial port to user data, DTU from idle to recover the data center communications.
- ❖ Ringing wakeup: SMS activation module, send a message (as shown in Figure 3.4) to the module so that the module is disconnected from the server.Such as: 123456,WAKEUP,ON

DTU login password (6character) ,WAKEUP,ON

Figure 3.4 Module Wakeup Message Format

- ❖ **Note:** The message format in the punctuation "," must be entered in the English format, "WAKEUP"can be lowercase.

- ❖ Ringing wakeup: Through the phone call in the DTU SIM card number, use the DTU to hang up, it has awakened. This model can reduce the communication cost of GPRS flow, but DTU from idle state to restore communication ability (with again connection server) requires a certain amount of time, this is related to the local network, usually for several seconds to tens of seconds.

Table 3.1 Comparison of various working modes

Operating Voltage	Hardware status	Operating Voltage	GPRS link	wireless network connection	mode	Communication recovery time	GPS link	GPS recovery time
Normal mode	GPRS mode ON +GPS mode ON	<370mA	Keep	Keep	No recovery	Immediate	Keep	Immediate
	GPRS mode ON +GPS mode OFF	<370mA	Keep	Keep	No recovery	Immediate	Disconnect	<60s
Idle mode	GPRS mode ON +GPS mode ON	<70mA	Open	Keep	SMS/ Serial data	<5S	Keep	Immediate
	GPRS mode OFF +GPS mode ON	<60mA	Disconnect	Disconnect	Serial data	<30S	Keep	Immediate
	GPRS mode ON +GPS mode OFF	<60mA	Disconnect	Disconnect	Serial data	<30S	Disconnect	<60s
	GPRS mode OFF +GPS mode OFF	<60mA	Disconnect	Disconnect	Serial data	<30S	Disconnect	<60s

3.2.8 DTU MODE

This parameter is used to set the DTU role, when the DTU mode configuration for the "client mode", DTU initiative connections to servers in the data center. When the DTU mode configuration for the "server mode", the server waits for a connection to the client.

- ✧ **Note:** The current device only supports client mode

3.2.9 SVRCNT

The DTU allows you to set up a primary center and a backup center, this parameter is used to control a number of data center, if the number of data center station is set to 1, the backup center become invalid.

3.2.10 DNS

When you use a domain name connection data center, need to configure the DNS IP. The use of local mobile DNS server connection would be more quickly, such as Guangdong Mobile DNS server IP address is: 211.136.20.203, Shanghai mobile DNS server address: 211.136.17.107, Beijing mobile DNS server address: 211.136.18.171. Of course, you can also search for "Chinese DNS server list" on the "Baidu", find a local DNS server configuration. In addition, this can be left blank, the use of DTU internal curing DNS address.

3.2.11 SVRPWD

In order to increase the security of the data center, DTU log on the target server will send a packet called "registered package" data (see Section 3.4). In the registration packet parameters, users find the software login password does not match, you can refuse to log on the device. "Login Password" can be set to any 8-byte string.

3.2.12 Parameters Of Main Center Server

A target server settings include the IP address and port number, if the server does not have the fixed IP address, you can use the domain name. In the server's IP address is valid, the domain name will be ignored.

Note : In the network communications, there are two ways to TCP and UDP communication.

The TCP communication is based on communication connection mode, one for the server, the other one for the client, in the initial state, the server in the listening state, wait for a client to connect to a server, data center applications usually server mode, while DTU usually client mode. In the TCP communication mode, any party in the received data packets must be carried out after the response, so the method has the advantages of reliable communication, but in communication speed will be slightly slower than UDP mode. UDP is not based on the communication connection, communication both sides are equal, any party in the received packet to each other after no response. The UDP has the characteristics of communication speed, but the stability and data reliability than TCP. When TCP connection is established, the DTU logon data center server can exchange data; while UDP connection, data center hosts and DTU to establish a UDP connection. Because the DTU in the mobile operator's network, so the network (Internet) device cannot communicate directly with the DTU. In this case DTU has to connect public

Network for initiative. When DTU send data to data center by UDP mode, the data frame has IP address and Port number. Then data center can built a connect channel by these information. But it is unstable and easy to lose data in GPRS UDP mode. So suggest not to use UDP mode.

✧ **Remark:** At present, DTU LXI680 only supports TCP mode.

3.2.13 Standby Central Server Parameter

A target server to set the IP address and port number, if the server does not have the fixed IP address, you can use the domain name. In the server's IP address is valid, the domain name will be ignored. The connection attempt failed many times the main center server, DTU will automatically switch to connect the standby center server. When using the standby server, if it is remote configuration connection is suddenly disconnected, DTU will reconnect the standby server. If it is in work mode suddenly disconnected, the target server will switch back to the center server.

3.2.14 Reconnect Interval Number

In the network signal is not good, or the data center server fails, connecting the target server may not smooth; if DTU continues to try to connect, it will produce a large amount of data flow, increase the burden on the user. Through this parameter, the user can easily control the connection condition.

Target reconnection interval for control of two attempts to connect time, minimum 20s, maximum of 65534 seconds. For example, suppose you configure reconnect interval is 200s, connect the number is 5, the IP and port number of main center and backup center has set. DTU tries to connect the main center, if the DTU connection failed, with intervals of 200s repeated attempts to connect the main center, the opportunity to run out until 5. Then, the DTU will switch the target server, try connecting standby central, if the connection fails, will connect the backup center in 200s, until the 5 connecting the opportunity to run out. If the system is running out of 10 connection opportunities, system will enter the waiting time. System add interrupt interval increasing function, that is to say when a number of main and standby service center connected after the failure, connection interruption interval time will increase the number of a set (connection interruption interval increasing time). So, with the more and more number of main and standby service failed to connect, disconnect interval is also more and more big, until the upper limit set.

3.2.15 Serial Port Baud Rate

The control parameters of DTU serial communication baud rate, must use standard baud rate communication, support the baud rate as shown in table 3.24.

Table 3.2 Baud Rate

Standard Baud Rate									
300	600	1200	2400	4800	9600	19200	38400	57600	115200

3.2.16 SERDAT, SERSTP

This parameters control the serial character data format, the user to set according to its own serial equipment requirements.

3.2.17 SERCHK

This parameter controls the parity type serial communication, value relations as shown in table 3.3.

Table 3.3 Serial port check and parameter

Check bit	No check	Odd check	Even check
Settings	NONE	ODD	EVEN

3.2.18 BEATTIM

After the module is connected to the server, if long time no data flow, module connection will be the operator cut. In order to maintain active connections, the module will send a few bytes intermittent meaningless data to the server, the data is called a heartbeat packet. Two heartbeat packet between the interval time can be set according to the local network situation, usually tens of seconds. Users can set the heartbeat packet interval by this parameter ranges from 30 to 65534 (unit: seconds).

3.2.19 BEATOVER

When the heartbeat packet is sent, if the heartbeat packet is not received within the timeout response packet, this situation occurs three times in a row, it should appear abnormal re connection for DTU network. Users can set the heartbeat packet response timeout by this parameter ranges from 1 to 65534 (unit: seconds).

3.2.20 BEATDATA

The beatdata can be set to any ASCII string. Users can also set their own heartbeat packets data, 20 bytes in length, such as: "BeatData", when using the AT commands to configure the following format:

"AT+BEATDATA=BeatDat"

3.2.21 SERS, MTU

There is two ways to discriminate a data frame after DTU receives the 1st byte from user client. Firstly, when the data length has reached Max Limit(MTU), the current frame is finished. Secondly, when the data period is reached Max Limit(SERS), the current frame is finished. From next byte it is counted for next frame. If there is no special requirement, please refer to figure 3.8

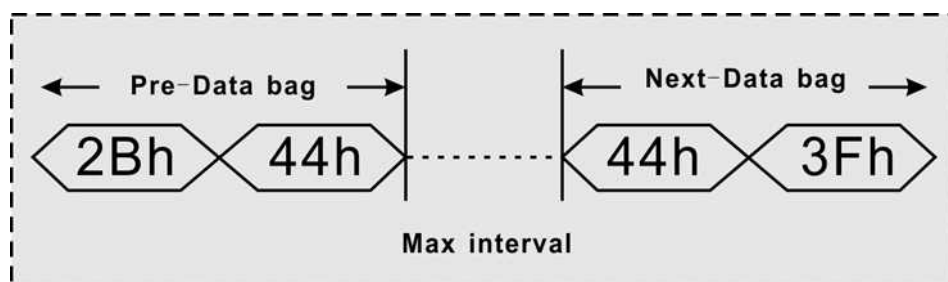


Figure 3.5 The time interval between two bag

In GPRS networks, large data packets will increase the propagation delay, and easily lost, it can be based on reasonable maximum length of local network setup data packet. When GPRS receives the data reaches the maximum number of data packets, the module will send them as a data packet, these actions are transparent to the user (also can be said to be hidden).

NOTE: If the params "SERS"(Max Frame interval) and "MTU"(Max Frame length) is set to not reasonable, it will increase the GPRS data flow or the transfer delay. User can set them by actual case. If there is no special requirement, it refers that "SERS" is 100 ms and "MTU" is 1024 Byte.

3.2.22 IDLETIME

When there is no user data requests sent over this time value, GPRS module is powered down or offline.

3.2.23 APN, USRNAME, PWD

These parameters usually use the default values. If you use a special VPN card, then these parameters set according to the actual situation.

3.2.24 SMSNO

Under normal circumstances, you do not need to configure the message center number, the default configuration can use SIM card. If the message center number is not configured correctly, DTU will not send Short Message. The format of SMS number center is "+861380xxxx500" (note: "+86" is necessary), Refer to SMS carrier. Usually do not need to modify the SIM card SMS center number. As long as you keep the project is empty (not fill any characters), then the SIM card SMS center number will not be modified. When the device is set SMS function, must ensure that the correct message center number, otherwise send and receive text messages will not be carried out smoothly.

3.2.25 USERNO1, USERNO2, USERNO3

The LXI690G can be set to three authorization number, mobile phone number can be authorized to DTU configuration parameters and wake up with a text message or ringing, and when DTU configured as a server, you can learn DTU local IP and port number.

NOTE: When any one of the three authorized user number is set to "888888", any number in the password is correct, you can carry out the message to the DTU, not including ringing.

3.2.26 DTU Login Password

When an authorized user using SMS settings DTU, must send the correct DTU login password, otherwise unable to configure, the parameters must be configured for 6 bit (any character).

3.2.27 Debugging Information

This parameter has four options are: AMPL, STAN, SMPL, OFF. When "OFF" option is not chosen, client can get the feedback after transferring configuration to DTU in configuration Mode.

- ❖ **Feedback information:** If config DTU by some computer's super terminal tools, the tools can't display what has transferred into DTU. So the feedback information need to show in computer. But when config DTU by some device, it has no any help for feedback information. Suggests to close it.
- ❖ **Debugging information:** In order to operation convenient staff debugging DTU, DTU will print out information about the device to work from the local serial port, such as connecting to server information. Debugging in the system is finished, the debugging information is useless, you can shut down the function.

3.2.28 GPRS CSQ

This is a read-only project, mainly used for system debugging understand the signal of DTU locations. The information obtained using the command format "CSQ: XX", the XX refers to the signal

strength, can be "0 to 31", the 31 refers to the strongest signals, 0 refers to the weakest, but only "10 to 31" strength can be normal communication. If the output signal strength for the "+CSQ: 99,99" no signal.

3.2.29 Help

Use this command to obtain help information, serial port can be configured DTU parameters to facilitate users without manual data and special configuration tool case.

3.2.30 RSTDTU

When you activate the project, the module will perform a software reset action.

3.2.31 DEFAULT

When you activate the project, the module will restore the default settings, mainly for the DTU configuration after the restore default settings.

3.2.32 SETLIST

Although the use of the read command can read any configuration items, but bulk read it to repeatedly sending a read command, affect the operation efficiency, especially in the remote configuration mode is not convenient. It can use this command to get all params from DTU.

3.2.33 OUTSET

The user to complete all configuration, use this command can make DTU exit the configuration mode, and then use the new configuration parameters into the normal operating mode. After using this command in remote configuration mode, DTU will save the new configuration parameters to the FLASH.

3.2.34 IO0 data acquisition channels

IO0 is to provide users with a data acquisition interface. User only need to collect external data to IO0 auxiliary port, and set IO0 configuration with a appropriate parameter. when DTU is in normal operation, user can remote monitoring of the external data by PC software. There are several features can be configured.

- ❖ IO0 function configuration (**IO0FUNCFG**): digital input, digital output, analog input, analog output, resistance measurements are five kinds of fixed string type.
- ❖ IO0 Polarity configuration (**IO0TOUCHCFG**): Low effective, high efficient, change effective are three kinds of fixed string type.
- ❖ IO0 Analog input matching set value (**IO0ADCGATE**): 0-5000mV
- ❖ IO0 Resistance measurements match the set value (**IO0RSMGATE**): 10-5000 Ω
- ❖ IO0 Set frequency the trigger (**IO0FILTERNUM**): 1-99
- ❖ IO0 Sampling period (**IO0SAMPLING**): 50-65534mS
- ❖ IO0 Data reporting enable control (**IO0REPORTENB**): ON, OFF are two kinds of fixed string type.
- ❖ IO0 Data reporting time interval (**IO0REPORTIME**): 5-65534 seconds ❖ IO0 Message alarm enable control (**IO0MSGENB**): off, phone number1, phone number 2, phone number 3 is four kinds of fixed string type.
- ❖ IO0 Alarm message content (**IO0MSGCONTENT**): Limit ASCII visible characters (**symbols, letters, numbers**) is any character type.
- ❖ IO0 Checking (**IO0CHECK**): 1 data center inquiries is equivalent to a reporting process. 2 SMS query.
- ❖ IO0 Analog input correction factor (**IO0ADCALIB**): 0-19000
- ❖ IO0 Analog output correction factor (**IO0DACALIB**): 0-19000
- ❖ IO0 Resistance measurement correction factor high (**IO0RSCALIBH**): 0-19000
- ❖ IO0 Resistance measurement correction factor low (**IO0RSCALIBL**): 0-19000

IO0 assisted acquisition functions to achieve expansion port operations, the following list:

- ① If the configuration IO0 function (**IO0FUNCFG**) digital inputs

When **IO0REPORTENB** is ON, according to the **IO0REPORTTIME** time interval, port status is reported on the basis of **IO0SAMPLING** interval basis, if meet the **IO0TOUCHCFG** conditions and achieve **IO0FILTERNUM** number. When the **IO0MSGENB** is not OFF, according to **IO0MSGENB's** phone number, the contents of the **IO0MSGCONTENT** is reported.

Note: When **IO0TOUCHCFG** is low effective, high port for the trigger condition. When **IO0TOUCHCFG** is high effective, low port for the trigger condition. When **IO0TOUCHCFG** change effectively, port-level change trigger conditions.

② If the configuration IO0 function (**IO0FUNCFG**) digital output

When **IO0REPORTENB** is ON, according to **IO0REPORTTIME** time interval, it reports port status. according **IO0TOUCHCFG** and **IO0SAMPLING** to output high and low voltage.

Note: When **IO0TOUCHCFG** is low effective to output low. When **IO0TOUCHCFG** is high effective to output high. When **IO0TOUCHCFG** change effectively, according **IO0SAMPLING** port for level adjustment.

③ If the configuration IO0 function (**IO0FUNCFG**) as an analog input

When **IO0REPORTENB** is ON, according to the **IO0REPORTTIME** time interval, it reports port status. on the basis of **IO0SAMPLING** time interval, if meet the **IO0TOUCHCFG** and **IO0ADCGATE** conditions, and reached the number of **IO0FILTERNUM**, in the **IO0MSGENB** is not OFF, according to **IO0MSGENB's** phone number, send the contents of the **IO0MSGCONTENT**.

④ If the configuration IO0 function (**IO0FUNCFG**) analog output

When **IO0REPORTENB** is ON, according to the **IO0REPORTTIME** time interval, it reports port status. according **IO0ADCGATE** output corresponding PWM (0% -> 0mV, 100% -> 5000mV).

⑤ If the configuration IO0 function (**IO0FUNCFG**) resistance measurement

When **IO0REPORTENB** is ON, according to the **IO0REPORTTIME** time interval, it reports port status. on the basis of **IO0SAMPLING** time interval, if meet the **IO0TOUCHCFG** and **IO0RSMGATE** conditions, and reached the number of **IO0FILTERNUM**, in the **IO0MSGENB** is not OFF, according to **IO0MSGENB's** phone number, send the contents of the **IO0MSGCONTENT**.

Notes: when **IO0TOUCHCFG** is low effective, the input resistance is higher than **IO0ADCGATE** as the trigger condition. when **IO0TOUCHCFG** is high effective, the input resistance is lower than **IO0ADCGATE** as the trigger condition. not to support "**IO0TOUCHCFG change**".

3.2.35 RSRVPARM1、RSRVPARM2、RSRVPARM3、SRVPARM4

DTU additional configure four retention parameters for functional expansion and upgrading. The RSRVPARM1 and RSRVPARM2 as string format, RSRVPARM3 and RSRVPARM4 as the data format, the range of 0 ~ 65534.

3.2.36 GPS DATA REPORTING AND INQUIRY

When GPS data reporting interval is set to 0, that is not actively reporting GPS data. Other value represents the time interval in seconds.

- ❖ There are five kinds of GPS data type selection: GGA, GSA, GSV, RMC, VTG
- ❖ When the power supply of the GPS is set to IDLOFF. Meaning: When not actively reporting GPS data, disconnect the power supply of GPS
- ❖ When the power supply of the GPS is set to IDLWAIT. Meaning: When not actively reporting GPS data, keep the GPS connection data center can query through the GPS instruction, extraction of GPS positioning information.
- ❖ "GPS data reporting interval" using the default value of 0, the GPS data will not take the initiative to report to the data center.
- ❖ Click on the "GPS access" to get the current GPS data. (the specific steps, according to the software operation.)
- ❖ GPS data packet format explanation (for example)

① \$GPRMC,090756.173,V,0000.0000,N,00000.0000,E,,,120211,,,N*7F

② \$GPRMC,090758.182,A,3958.2382,N,11621.4878,E,1.06,201.56,120211,,,A*6A

Table 3.4 GPS DATA REPORTING AND INQUIRY

Name	Example	Unit	Description
ID	\$GPRMC		RMC Protocol header
UTC time	090758.182		hhmmss.sss, Example is the UTC Time 9:07 58.182 s
Status	A		A represents valid location; V represents invalid location
Latitude	3958.2382		ddmm.mmmm, Example represents 39 degrees 58.2382 minutes
North and south latitude	N		N represents north latitude, S represents south latitude
Longitude	11621.4878		dddmm.mmmm, Example represents 116 degrees 21.4878 minutes
East and west longitude	E		E represents east longitude; W represents west longitude
Ground speed	1.06	MPH	1.06 mph in sample。
Ground heading	201.56	Degree	North as the reference standard
Date	120211		ddmmyy, Example represents 2011. 2 . 12.
field direction		Degree	E represents east ; W represents west 。
Check	*6A		
<CR><LF>			News end marker

3.3 SMS Configuration

In addition to the use of local and remote configuration of DTU, LXI690G also supports message settings. When the data center server failure, DTU was unable to connect to the server, you can use mobile phone SMS to configure the DTU, which is connected with other data center or make DTU reset, as shown in figure 3.6. When the DTU configuration is complete, the phone will send a reply message, which means that the configuration was successful.

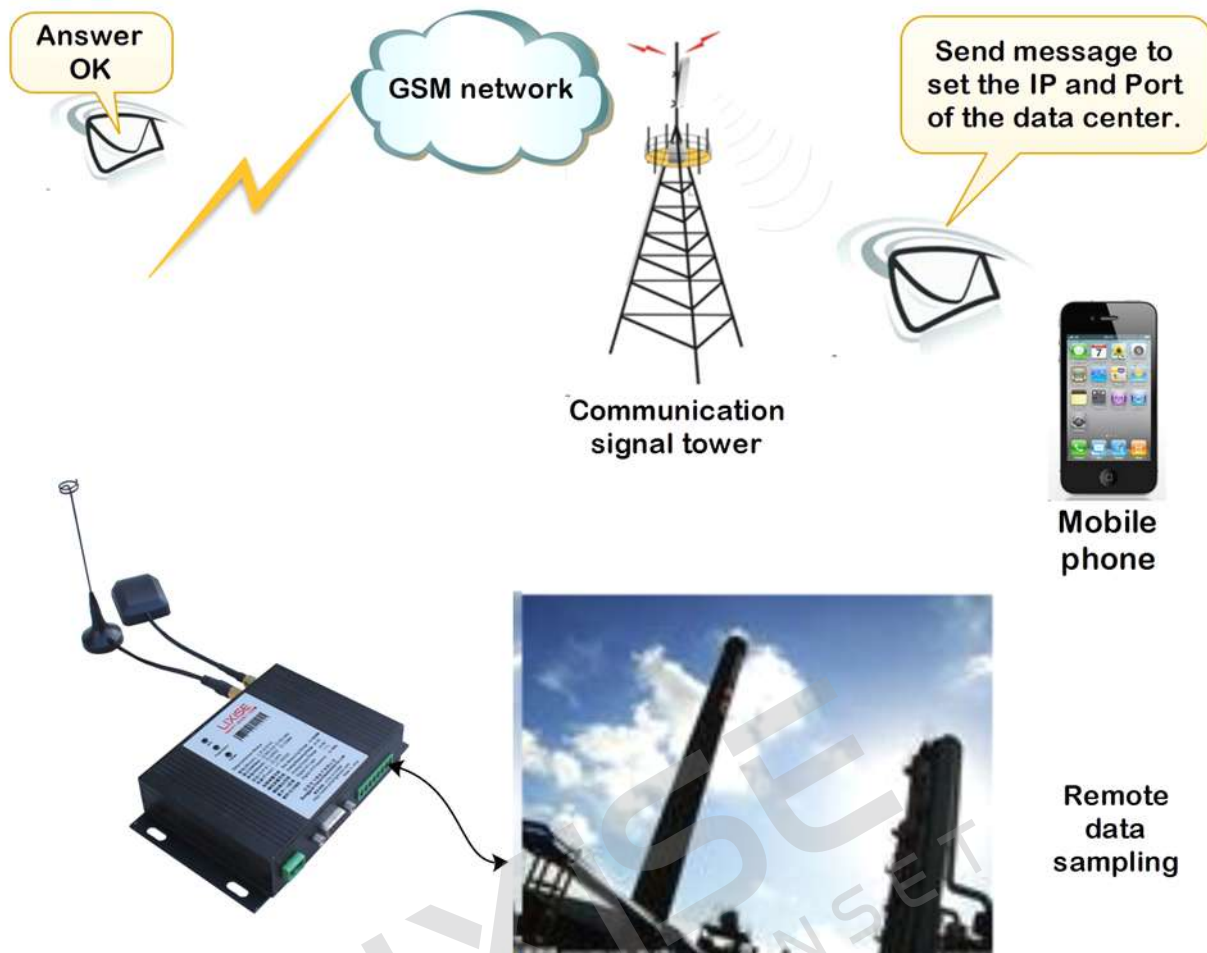


Figure 3.6 Schematic diagram of SMS configuration

Note: The message is not configured to use the AT command, but there is a specific format, as shown in figure 3.7. The configuration message must follow the format, or they will not be correctly configured DTU.

DTU Login Password	Command 1	Parameter1	Command n	Parameter n	Command n+1
	Parameter command					No parameters Command

Figure 3.7 SMS configuration command format

- ❖ The message and local configuration commands, parameters are the same, a message can configure a single device parameters, we can also configure multiple parameters, but the user needs to control the message length of not more than 140 English character.
- ❖ SMS format has the following provisions: the SMS content must begin with DTU login password, SMS text must be in English, each command and parameters needed English punctuation ",", separated, the content of the message except the login password is case insensitive.

For example (Configure password: 123456) :

1. When you need to change the DTU destination IP and port number, send SMS as follows:

#123456,svrip,140.114.72.33,svrport,23,rstdtu,on

2. When you need a DTU IP connection mode changes to the domain name connection, send text messages as follows

```
#123456,svrip,,svrnam,dtu.lixise.com,svrport,8888,rstdtu,on
```

Note: When using domain name service(DNS) to land the network, it has to set "svrip" to empty.

3.Get CSQ by SMS

```
#123456,CSQ
```

DTU response to the above message configuration, if configured correctly, SMS returns authorized users such as: "Done (SVRPORT, 8888);" if there is not support command error or the content of the short message is returned "ERROR".

After the completion of all the parameters configuration, if you want to save DTU parameters to FLASH, need to join (OUTSET, ON) to exit the configuration commands.

✧ **Note:** the SMS configuration does not support command are as follows:

- | All the read commands (CSQ command except)
- | Restore default settings command(DEFAULT)
- | Get information command configuration parameters(SETLIST)
- | Print help information command (HELP)

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4 APPLICATION EXAMPLES

4.1 DTU and public network data center server

This section describes the DTU group network communication process.As shown in Figure 4.1

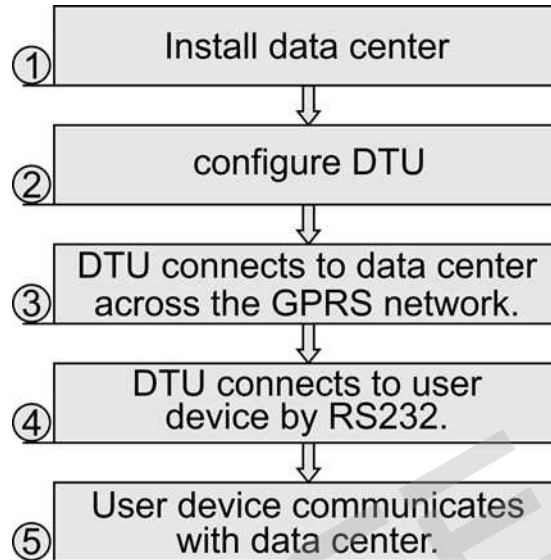


Figure 4.1 DTU application procedure

4.1.1 Establish Data Service Center

Suppose you want the company to set up the LAN IP address 192.168.0.20 data service center on the PC, the whole LAN gateway to the internet through a router,IP is 192.168.0.1(Router WAN port address);As shown in Figure 4.2.

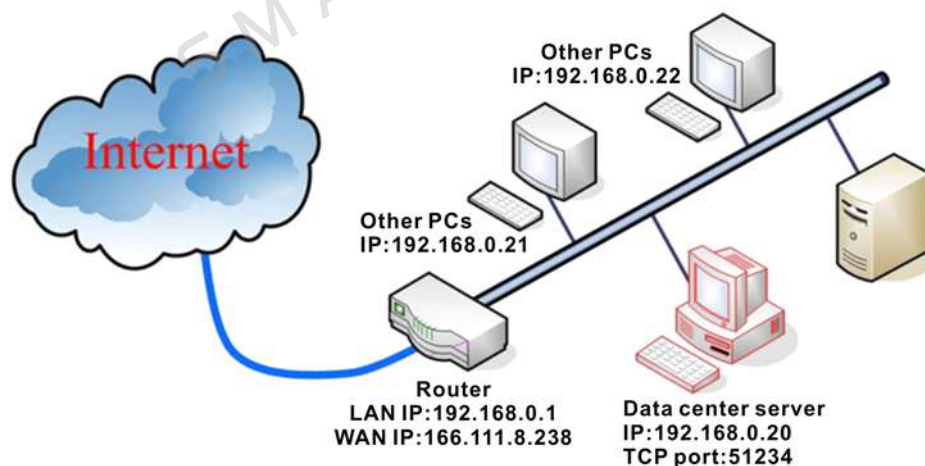


Figure 4.2 Data center network topology

In order to make your data center server to receive the public network to the data, we have to do to convert the network address on the router (NAT), port 51234 is mapped to a data center server IP address 192.168.0.20 (please refer to the specific setting method using routers use).

4.1.2 DTU Configuration

According to your need to set the DTU, see the section "Device Configuration" setting method.

Table 4.1 lists the setting items, you need to pay attention to is the IP address of the primary data center must be setup web server where the public IP address, 114.112.59.236, port number for the data center software working port, ie 51234.

Table 4.1 Configuration parameter list

Local settings	Target Setting	Transmission	Network parameters
DTUTYPE=LXI690G	SVRCNT=1	SERBAUD=57600	APN=CMNET
HDVER=V1.00	DNS=	SERDAT=8	USRNAM=
SWVER=V1.00	SVRIP=114.112.59.236	SERSTP=1	PWD=
DTUNAM=LXIDTU01	SVRNAM=	SERCHK=NONE	SMSNO=+8613800200500
DTUID=3000638303	SVRPORT=51234	FLOW=OFF	DTUMODE=CLIENT
PHON=13812345678	CNTMODE=TCP	BEATTIM=100	LCOPORT=
MODE=ONLIN	SVR1IP=	BEATDATA=FE	USERNO1=
	SVR1NAM=	SERS=100	USERNO2=
	SVR1PORT=	MTU=512	USERNO3=
	CNTMODE1=	IDLETIM=30	DTUPWD=123456
	TRYCNT=5	SETDAT=SAVE	
	TRYTIM=30		
	TRYSPAC=20		

4.1.3 DTU Connected Data Center

After configuring the DTU, the DTU exit the configuration mode, DTU will automatically enter the working mode, it will automatically connect to just set the data center servers.

4.1.4 DTU Connected User Devices

Put your serial devices connected to the serial port of the DTU, baud rate and data format of serial device and DTU to match the configuration of the interface, as shown in figure 4.3.

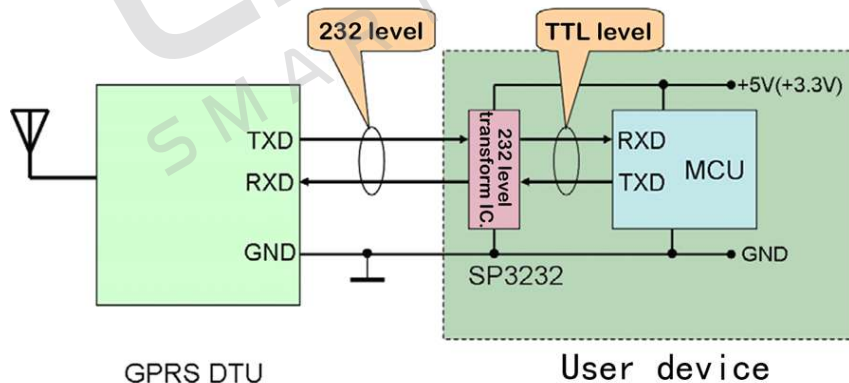


Figure 4.3 DTU and serial connections

4.1.5 User Equipment And Data Center Communication

After DTU connected to the data center, users and data center equipment can communicate the data.

5 Statement

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